The Origin of the Missing Galaxy Clusters

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Abstract: The Planck CMB data lead to conclusion that there should be about two times more galaxy clusters than we observe. Here, applying the lacking part of ultimate theory, i.e. the Scale-Symmetric Theory, we show that the discrepancy follows from the collisions/mergers of protogalaxy clusters at the beginning of the expansion of the Universe. The time distance to most distant galaxies is 13.866 ± 0.096 Gyr but they are already 7.75 Gyr old so we cannot see the collisions of protogalaxy clusters. It is a wrong assumption that creation of galaxies can last a few hundred million years only. For 8 times more spiral galaxies than elliptical galaxies, we obtain that there should be observed about 1.8 times less galaxy clusters than it follows from the Planck CMB data.

1. Introduction

The General Relativity leads to the non-gravitating Higgs field composed of tachyons [1A]. On the other hand, the Scale-Symmetric Theory (SST) shows that the succeeding phase transitions of such Higgs field lead to the different scales of sizes [1A]. Due to the saturation of interactions via the Higgs field and due to the law of conservation of the half-integral spin that is obligatory for all scales, there consequently appear the superluminal binary systems of closed strings (entanglons) responsible for the quantum entanglement, stable neutrinos and luminal neutrino-antineutrino pairs which are the components of the luminal Einstein spacetime (it is the Planck scale), cores of baryons, and the cosmic structures (protoworlds) that evolution leads to the dark matter, dark energy and expanding universes (the “soft” big bangs) [1A], [1B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguishes particles from their antiparticles [1A]. SST shows that a fundamental theory should start from infinite nothingness and pieces of space [1A]. Sizes of pieces of space depend on their velocities [1A]. The inflation field started as the liquid-like field composed of non-gravitating pieces of space [1A]. Cosmoses composed of universes are created because of collisions of big pieces of space [1A], [1B]. During the inflation, the liquid-like inflation field (the non-gravitating superluminal Higgs field) transformed partially into the luminal Einstein spacetime (the big bang) [1A], [1B]. In our Cosmos, the two-component spacetime is surrounded by timeless wall – it causes that the fundamental constants are invariant [1A], [1B].

Due to the symmetrical decays of bosons on the equator of the core of baryons, there appears the atom-like structure of baryons described by the Titius-Bode orbits for the nuclear strong interactions [1A].

The dark matter consists of the additional Einstein-spacetime components entangled with visible matter whereas the dark energy consists of free additional neutrino-antineutrino pairs (they interact gravitationally only) [1B].

The Double Cosmic Loop (the very early Universe) composed of protogalaxies was created inside the Protoworld [1B]. Due to the quantum entanglement and the four-particle symmetry that follows from the fact that there are the two species of stable neutrinos only i.e. the electron- and muon-neutrinos (the third unstable "neutrino", in assumption the tau-neutrino, consists of entangled three different stable neutrinos), the protogalaxies were grouped in bigger structures. The quantum entanglement leads to following formula which describes the number of binary systems of protogalaxies in the very early structures of the Universe [1B]

$$D = 4^d, \tag{1}$$

where $d = 0, 1, 2, 4, 8, 16$ for a flattened-spheroid-like/disc-like structures, and $d = 3, 6, 12$ for a chain-like structures. Formula (1) concerns particles as well [1A], [1D].

Each protogalaxy consisted of 4^{16} modified neutron black holes (MNBHs do not contain a central singularity but there is a circle with spin speed equal to the speed of light in "vacuum" c). Mass of each protogalaxy was about $M = 2.1 \cdot 10^{41}$ kg [1B]. The inflows of the dark matter and dark energy caused the exit of the MNBHs holes from their black-hole state.

The time distance to most distant galaxies is 13.866 ± 0.096 Gyr but they are olready 7.75 Gyr old [1B]. It leads to conclusion that we cannot see the collisions of protogalaxy clusters which took place at the beginning of the "soft" big bang. These collisions decreased number of the galaxy clusters. We can see that the CMB is 7.75 Gyr older than the most distant galaxies so the CMB should lead to more galaxy clusters than we actually observe (due to the duality of relativity, we can see the initial state of the CMB [2]). It is a wrong assumption that creation of galaxies can last a few hundred million years only.

Here we prove that the collisions of the protogalaxy clusters lead to a number ratio of 1.8 for the predicted clusters to actually observed clusters. On the other hand, the comparison of the analysis of the primary CMB temperature anisotropies given in Planck Collaboration XVI (2014) with the Planck Sunyaev-Zeldovich cluster counts leads to a factor of 2 [3].

2. Calculations

The upper limit for mass of an elliptical galaxy is about 10^{13} solar masses whereas for spiral galaxy it is about 10^{12} solar masses i.e. about 10 times smaller. It suggests that typical massive elliptical galaxy was produced in collision of two groups of protogalaxies each containing 4 binary systems of protogalaxies i.e. the total number of protogalaxies was 16. On the other hand, the massive spiral galaxies evolved from binary systems of protogalaxies i.e. the total number of protogalaxies was 2 [4]. It means that typical massive elliptical galaxy should have mass about 8 times greater than typical massive spiral galaxy. We can see that the collisions/mergers decreased number of massive galaxies. Denote the number ratio of massive spiral galaxies to massive elliptical galaxies by f. If X denotes present-day number of spiral galaxies (total number of binary systems of protogalaxies associated with spiral galaxies is X) then number of elliptical galaxies is X/f but each elliptical galaxy consisted of 8 binary systems of protogalaxies so total number of binary systems of protogalaxies associated with elliptical galaxies is $8X/f$. We can see that number of binary systems of protogalaxies Y calculated from CMB should be $Y = X + 8X/f$ whereas we should observe following number of spiral and elliptical galaxies $Z = X + X/f$. Assume that the number ratio

of massive spiral galaxies to massive elliptical galaxies is $f = 8$ (i.e. we assume equality of total masses of spiral galaxies and elliptical galaxies) – then the collisions/mergers of binary systems of protogalaxies decrease number of galaxies the R times

$$R = Y / Z \approx 1.8. \tag{2}$$

Already at the beginning of the "soft" big bang there were the greater cosmic structures composed of the binary systems of protogalaxies so we can apply the above described mechanism to colliding/merging protoclusters composed of binary systems of protogalaxies. We should observe about 1.8 times less the galaxy clusters than it follows from the CMB. It is close to observational facts [3].

We can see that the final result depends on the number ratio of the spiral to elliptical galaxies (for smaller f the ratio R is greater).

3. Summary

The Planck CMB data lead to conclusion that there should be about two times more galaxy clusters than we observe. Applying the Scale-Symmetric Theory, we showed that the discrepancy follows from the collisions/mergers of protogalaxy clusters at the beginning of the expansion of the Universe. The time distance to most distant galaxies is 13.866 ± 0.096 Gyr but they are already 7.75 Gyr old so we cannot see the collisions of protogalaxy clusters. It is a wrong assumption that creation of galaxies can last a few hundred million years only.

For 8 times more spiral galaxies than elliptical galaxies, we obtain that there should be observed about 1.8 times less galaxy clusters than it follows from the Planck CMB data.

References

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